

CHAPTER 7DROOFING AND INSULATION7D-01. INSULATION FOR BUILT-UP ROOFINGa. Preparatory Inspection

(1) This inspection is held before work begins. Information concerning the applicable materials, methods and schedule of installation is exchanged. The roof deck is inspected for readiness.

(2) Since roofing must be installed with the insulation, all matters relating to the built-up roofing and flashings are discussed.

(3) All requirements must be clearly understood before work can begin.

b. Material

(1) See that approved materials are being used.

(a) Check for use of proper type asphalt for roof slope involved. Label information must include the Equiviscous Temperature (EVT).

(b) The insulation must be approved thickness, type, and treated or faced as required. Remember that two layers of insulation are required.

(c) Have insulation thickness computations been submitted and approved?

(d) Check roof slope. Both insulation and vapor barrier must be mechanically fastened when slope is more than 1/4-inch per foot. Check fastened types required and approved.

(e) What type vapor barrier membrane will be used? Contractor may select from four types.

(f) Are wood nailers treated? Use only waterborne pressure treated wood.

(2) There are special requirements over steel decks.

(a) Check for use of urethane insulation on steel deck. Urethane cannot be used directly on steel decks. Use composite board with a Factory Mutual Research Corp, Class I rating.

(b) If isocyanurate is selected by the contractor, a Class I rating is required on steel decks.

(c) Is adhesive for use on steel deck fire rated?

(d) See above paragraph (1)(d) and plan detail for fastening nailers to steel decks.

(e) On acoustic type steel decks check for an applied vapor barrier.

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(f) Check insulation board for square edges.

(g) Check for tapered insulation. Fitup is extremely important for smooth surfaces.

c. Preparation of the Roof Deck

(1) See that the entire section of roof-deck construction is complete before vapor barrier and insulation application begins.

(2) Inspect the roof for being dry, smooth, firm, and dirt-free and free of projections and foreign materials. Check metal roof decks for holes, rust, or repair of paint coat-especially where deck has been welded.

(3) Note preparation and safety protection around roof openings.

(4) Run dryness test on the concrete deck.

(5) Protect roof drain and vent intake during roofing operations. Check for proper drainage at other times.

(6) Check the insulating concrete deck for dryness by weighing the deck sample for 50 percent moisture loss. This is necessary although base sheet is laid dry.

d. Application of Vapor Barrier

(1) Are weather conditions favorable?

(2) Has concrete deck been primed?

(3) Is bitumen kettle safely located? Fire extinguisher? Does kettle have an operable thermometer?

(4) Kettleman must be attending the kettle at all times when bitumen is heated.

(5) Check for asphalt temperature within 25° of EVT at point of application.

(6) Are joints in precast decks covered as required?

(7) Check for solid mopping and brooming for the 2 ply, 15 pound felt over concrete.

(8) Are fasteners for base sheet type vapor barrier the approved type for gypsum deck? For insulating concrete deck? Check fastened materials for specified fastening.

(9) Ensure that felts are maintained at a minimum temperature of 50°F. for not less than 24 hours prior to laying.

(10) Note ambient temperature prior to placing of vapor barrier.

(11) Does vapor barrier seal edge of insulation at openings? Do not seal with vapor barrier if edge of insulation is vented.

(12) Check for felt edge envelope formed with vapor barrier where insulation is vented. Install envelope in steep asphalt or bituminous cement at roof edges.

(13) Inspect the vapor barrier to assure that it provides a complete seal over the deck. See that method of brooming assures complete adhesion to deck, assures complete adhesion between plies, and eliminates air pockets.

e. Wood Nailers and Vents

(1) Nailers flush with the deck will be used with nailable insulation.

(a) On slopes more than $\frac{1}{2}$ -inch per foot nail vapor barrier to nailers.

(b) Nail first layer insulation.

(c) Nailers are installed as concrete is cast. Install parallel to the slope of the roof.

(d) Check for flush nailers to fasten flashings for roofing applied to the deck.

(2) Use surface mounted nailers at edges of insulation. Slot nailers for venting insulation; except on steel decks.

(3) Non-nailable insulation needs surface mounted nailers, parallel to the slope, when slope is more than $\frac{1}{2}$ -inch per foot.

(4) Check nailable securement requirements.

(5) Use 1-inch thick nailers on edge behind base flashings.

f. Application of Insulation

(1) On slopes up to $\frac{1}{2}$ -inch per foot.

(a) Check for solid moppings of hot bitumen over vapor barrier or directly to concrete deck.

(h) Limit bitumen to 12-15 pound per square on steel deck flutes. Use steep slope (Type III) asphalt.

(2) On slopes more than $\frac{1}{2}$ -inch per foot.

(a) Check for fastener requirements or,

(b) Use treated surface nailers between insulation section, parallel to slope.

(c) Is nailer thickness same as insulation?

(3) Use only dry insulation. Have wet insulation been removed from the work site?

(4) Plan must be to cover all insulation on same day applied with full roofing system.

(5) Apply insulation in at least two layers.

(6) Stagger joints between layers.

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(7) Lay top layer so that continuous insulation joint is parallel to the roof slope. Be sure this joint is not over flute openings of steel decks.

(8) Lay units with close joints. Be sure that no voids are built in by damaged boards or open joints.

(9) Remember the water cut-offs to protect insulation edges at end of work day. Remember to remove cut-offs at beginning of next work day. Check for wet insulation.

(10) Underlayment supports roofing on steel decks not requiring insulation. Same application as for insulation. Use insulation manufacturer's recommended thickness.

7D-02. BUILT-UP ROOFING

a. Preparatory Inspection

(1) The quality control inspector for the contractor is responsible for this inspection meeting. The roofing applicator and Government Inspection representatives must attend and participate.

(2) Check the agenda. The insulation, roofing and sheetmetal phases should be held together as all this work must be coordinated.

(3) Discuss types of machines which will be used on the roof. The deck and installed materials cannot be subject to damage.

b. Material

(1) Use only asphalt felts with hot asphalt or coal tar felts with hot cool tar.

(2) Check for labels on all materials. Labels must identify specified and approved materials.

(3) Contractor must prove specified material without proper labels. Test if necessary.

(4) Check surface treatment materials.

(5) Are the type IV glass-fibered felts specified in cold climatic locations.

c. Preparation of the Roof Deck

(1) See paragraph 7D-01 c.

(2) Bitumen kettle is not allowed on the roof deck.

(3) Do not overload deck. Remember that all material must be protected from weather.

(4) The system of roofing application should provide for free drainage at all temporary terminations.

(5) Remember the dryness test for concrete decks. Remember the air-dry density test for insulating concrete decks.

d. Application of Roofing

- (1) Check felt temperature from storage.
- (2) Check bitumen temperature control to prevent overheating.
- (3) Check hot asphalt supply system for specified EVT at point of use. A maximum of 25° F variation from EVT is permitted. No more at anytime.
- (4) Are ambient weather conditions suitable? Temperature at least 40°F? Too windy? Threat of rain?
- (5) Note the method of laying the felt that is immediately behind the mopping of bitumen and assure that the felt is broomed-in so that the layer will be free of air pockets, wrinkles, and buckles.
- (6) Check the requirements for and the installation of base sheet. This is the only occasion when hot coal-tar could be applied to an asphalt base sheet.
- (7) Are cant strips installed as required?
- (8) Are all felts at specified lap? Four plies go down together.
- (9) Systems on wet decks use a base sheet. Then the three plies go down together.
- (10) Is roofing run to top of cant?
- (11) Check for two extra plies of felt at eaves and rakes for envelope bitumen stop. Check for application to deck or insulation in steep slope asphalt or bituminous cement. Use only organic or asbestos felts for these envelopes.
- (12) For fiberglass felt system the edge envelopes must be separately placed. Fiberglass felts can't be used.
- (13) Check aggregates to be used for surfacing:
 - (a) Has aggregate been sampled and approved for use?
 - (b) Is aggregate dry and free from dust, sand, loam, and other foreign material?
 - (c) Is stone waterworn and free from sharp, flat and angular pieces?
 - (d) Is slag crushed, blast-furnace slag?)If you cannot tell visually, check certificate of compliance.)
 - (e) Is aggregate spread while bitumen is still hot? Is it thoroughly and evenly embedded in hot bitumen? Have aggregates and bitumen been applied at the specified weights per unit area?
 - (f) Check for the removal of loose aggregate. Are there base spots?

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(g) Check method of transporting and storing aggregate on roof to assure that felt and flashing has not been damaged and to prevent excessive loading of roof in localized areas.

(14) Cap sheet may be specified instead of the flood coat and aggregate surface. Check for special requirements. Cap sheet should be rolled into hot asphalt to prevent blistering.

(15) Use a glaze coating of hot bitumen when rain is about to occur.

(16) Glaze coat is only an emergency treatment.

(17) Check to see that the roof drains have been set at proper location and elevation, that they are properly flashed and that they are clean and provided with gratings when roofing is completed.

(18) Are roofing samples being taken? Check sample immediately for free water, bitumen skips and weight. Record results and replace sample unless a deficiency exists. Sample may be replaced depending on nature of deficiency provided a firm understanding can be reached prior to replacement.

(19) If finished or unfinished roof sections are used for traffic, be sure that roofing is protected. Are temporary plywood runways needed?

(20) Check for felt fastenings requirements on roof slopes more than 1/2-inch per foot, Do not use coal-tar on these slopes.

7D-03. FLASHINGS

a. Preparatory Inspection

(1) Shop drawings for sheet metal roof flashings will be discussed at this inspection. See Chapter 7E of this guide for details.

(2) Flashings in this paragraph include the felt strip flashings and plastic base flashings and their requirements will be clearly understood.

(3) Will flashing work be coordinated with roofing?

(4) Check for same day installation to completely waterproof the roofing area begun each day.

(5) A copy of the roofing felt manufacturer*s published flashing recommendations is required.

(6) Check for flashings at all projections through roofing.

b. Material

(1) Check that the asbestos flashing sheet has a built-in reinforcing fabric. This is required even though not in manufacturer*s recommendations.

(2) Where the glass fiber system is to be installed, use the mineral (glass fibered) cap sheet. See label for conformance to SS-R-630, Class 3.

(3) Check label on bituminous cement for asphalt base Type I, per SS-C-153.

c. Base Flashing

(1) Check for selection of 2-ply or 3-ply system.

(2) Be sure the manufacturer's published recommendations are available and used.

(3) Check installation for loose plies. Embed all sheets fully into adhesive and press into position.

(4) Are plies mechanically fastened at top of vertical leg?

(5) Check for felt strip over horizontal joint with roofing.

d. Strip Flashing

(1) Two ply strip flashing required.

(2) Check for solid coatings of bituminous cement.

(3) Install strip flashings before surfacing treatment, over all horizontal edges of sheetmetal such as gravel stops, roof drain and pipe flashing flanges, metal base flashings, etc.

7D-04. ROOF WALKWAYS AND LADDERS

a. Wood Walkways

(1) Check for waterborne pressure treated wood.

(2) Are cut edges being treated?

(3) Are pads of premolded filler strips being used beneath wood bases? Locate these before roofing surface treatment.

b. Composition Type Walkways

(1) Is material of specified thickness?

(2) Is material pressed into hot bitumen over top roofing ply?

(3) Is space provided between sections for drainage.

c. Precast Concrete Walkways

Check the requirements for size, location and spacing. Be sure roofing surface is clean. Precast concrete units are usually set loose over the waterproofed surface.

d. Ladders

(1) Are ladders located with walkways?

(2) If ladders are anchored into roofing, check for relocation to sidewalls.

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7D-05. SINGLE PLY ROOFING

Although there are over eight different generic types of single ply roofing materials, and many more systems, only the EPDM (Ethylene Propylene Diene Monomer) type is specified for CE use. This is a synthetic rubber material. The following deals with systems using that material.

a. Submittals

(1) Check for receipt of the certificate attesting to material compliance. Remember the certificate must be signed by an officer of the manufacturer's firm.

(2) The following must be received and approved before roofing can begin:

- (a) Manufacturer's installation instructions.
- (b) Samples of the membrane, joint cement and sealant.
- (c) Layout drawings and all flashing details.

b. Materials

(1) Check the EPDM material labels closely for spec and certificate compliance.

(2) Check storage site for temperature and weather protection. Adhesives and sealants are especially sensitive to these conditions.

(3) Ballast for surface covering must be clean and well graded.

(4) Check treatment for wood nailers and rants. Same as for built-up roofing.

c. Application of Roofing

(1) A preparatory inspection must be held before roofing begins.

(2) Roof deck must be in same condition as for built-proofing. This includes a positive air-dry density test for insulating concrete roof deck.

(3) Check manufacturer's instructions.

(4) Are the laps joints between sheets of EPDM at least 3-inches wide?

(5) Are laps made to shed water?

(6) Check special treatment at expansion joints for drainage and waterproofing.

(7) Check for perimeter nailers and adequate fastening of the membrane.

(8) Have all joints been carefully inspected before concealing with ballast?

(9) Flashings must be installed same day as roofing membrane to waterproof area covered.

(10) Remember cutoffs at end of day or when rain is imminent.

(11) See Paragraph 7D-01 for board insulation and vapor barrier checklists. Board insulation may be loose laid instead of usual adhesion method for built-up roofing. Check the specs.

7D-06. FLUID APPLIED ROOFING

The system given in the specs includes spray-applied urethane foam insulation applied to broom finish concrete roof decks. Two coats of spray-applied silicone rubber cover the urethane.

a. Submittals

(1) Check applicator*s experience for satisfactory performance.

(2) Check for manufacturer*s application instructions and material certificates of compliance.

(3) Have samples been examined?

(4) Does roofing system meet the Underwriters Laboratories UL 790 test for fire resistance?

(5) Has insulation thickness computation been approved?

b. Materials

(1) Check labels for compliance.

(2) Is there enough coating material to cover all areas to specified dry film thickness?

c. Application of Urethane Insulation

(1) Check the complete plan of application during the preparatory inspection.

(2) Has equipment been calibrated? At the beginning? Daily? More frequently as required?

(3) Is thickness as determined for "U" value?

(4) Lap-in layers.

(5) Check surface smoothness and slope for drainage.

d. Application of Coatings

(1) Protective coating must be applied same day to the urethane foam.

(2) Check dry film thickness.

(3) Finish coating must be free of pinholes?

(4) Check for sheet elastomeric base flashings.

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(5) Is a granule finish required? Are walkways included? It is extremely important that walkways be provided where traffic is expected as this system is extremely susceptible to damage.

7D-07. STRIP SHINGLE ROOFING

a. Preparation for Installation

(1) Have the required samples been submitted and approved? Do shingles on site match the approved samples? Are they labeled as U.L. approved? Are they wind resistant type?

(2) Is roof clean, dry, and otherwise ready for roofing? Check to cover knot holes and splits with sheetmetal plates.

(3) Are flashings installed or on hand to be installed concurrently with roofing?

(4) Check for proper installation of under layment and metal edge drips. Edge drip strips are installed over the underlayment.

(5) Check slope as double layer underlayment is required on slopes to 4-inch per foot.

(6) Check for special requirements if in cold climate where ice forms at building eaves. Either a sheet metal eave flashing or layer of bituminous cement should be required.

b. Installation

(1) Check starter course of shingles, at the eaves. Is it a double or triple layer of shingles? Does this starter course extend 3/4 inch beyond eave line to form a drip?

(2) Check alignment of layers and rows of shingles. Start rows at center of roof for spans over 30 feet and lay to chalk lines or other guide for a neat job.

(3) Check exposure of shingles on hips and ridges. Are all nails concealed?

(4) Check that each shingle tab is cemented in place with bituminous cement with a contact area of at least 1 square inch. Check self-sealing type shingles.

(5) Self-sealing shingles are usually required and the manufacturer's warranty furnished by the contractor provides insurance against unit blow-off. The contractor shall be responsible for replacement of blown-off or damaged shingles.